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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/692,584      | 10/24/2003  | Mukerrem Cakmak      | 089498-0447         | 9481             |

7590

02/09/2005

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| EXAMINER |
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LEE, RIP A

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| ART UNIT | PAPER NUMBER |
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1713

DATE MAILED: 02/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/692,584

Applicant(s)

CAKMAK ET AL.

Examiner

Rip A. Lee

Art Unit

1713

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☒ Claim(s) 6-8 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>05-28-2004</u> . | 6) <input type="checkbox"/> Other: ____.  |

## DETAILED ACTION

### *Claim Objections*

1. Claims 6-8 are objected to because of the following informalities: The claims describe use of nanoparticles in terms of a volume percentage, however, the meaning of this term is unclear because the specification is devoid of any teaching of how this quantity may be determined. As such, one of ordinary skill in the art would not be reasonably apprised of what constitutes "percent by volume" or how to practice the present invention in order to obtain the requisite volume percentage.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-5, 9, and 10 are rejected under 35 U.S.C. 102(a) as being anticipated by U.S. Patent No. 6,407,155 to Qian *et al.*

The present invention is drawn to a process which subjects a body of polymer to deformation to produce strain hardened polymeric products comprising blending polymer and nanoparticle to produce a polymeric composition, forming a film from the composition, and subjecting the composition to strain hardening. According to the current specification, it is the addition of nanoparticles that imparts novel strain-hardening characteristics to cast films (page 4,

line 26). Stretching (uniaxially or multi-axially) of films so that the polymer chains become oriented in the stretch direction leads to strain hardening (page 6, lines 21-24).

The prior art of Qian *et al.* relates to methods for making nanocomposite materials by forming a mixture of polymer matrix and nanoparticulate filler and melt blending said mixture (claims 1 and 41). The filler is a phyllosilicate clay, and it is nanoparticulate because the thickness of individual platelets is on order of Ångstroms (col. 5, line 34). The nanocomposites of the invention are used in fabrication of films (col. 20, line 64), and Qian *et al.* teaches the technique of biaxial stretching of the film to increase dimensional stability (col. 21, lines 16-31). Following the teachings of the present invention, incorporation of nanoparticles would impart strain-hardening characteristics to the films of Qian *et al.*, and since the film is stretched biaxially, it follows that the strain hardening phenomenon does occur.<sup>†</sup> As such, the subject matter of present claim 1 is anticipated by the cited reference.

The remaining claims describe meaningful developments of the present invention. With respect to present claim 2, the patent teaches use of polyolefins and polyamides (nylons), *inter alia*, as the host polymer (claim 16; example 8; col. 16, lines 10-25). The subject matter of claims 3-5 is also disclosed in Qian *et al.* The shape of the filler is best described as a platelet (col. 5, line 36), and this is considered a particle of irregular geometry. Each layer has thickness

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<sup>†</sup> Strain hardening is defined as the point in which there is a sudden upturn in the true stress/true strain curve for the composition (see instant specification, page 6, line 12). Stress/strain curves generated from test pieces made in Qian *et al.* show analogous sudden increase upon application of external stress (see Figure 1). Thus, it is evident that the presence of nanoparticulate clays in compositions of Qian *et al.* imparts strain-hardening characteristics to the overall composition.

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of about 3-50 Å, or 0.3-50 nm (col. 5, line 34). At least one dimension of the filler is in the nanometer range; therefore, the filler qualifies as a nanoclay. Specifically, montmorillonite clay that has been intercalated (*i.e.*, substituted) with onium ions is used as filler (col. 7, lines 36 – col. 8, line 61; example 1). Regarding claim 9, clearly, the thermoplastic resin must be at least partially molten in order to effect strain hardening by stretching. To corroborate this notion, Qian *et al.* states that the composition is derived from melt blending (see claims 1 and 41). The film is the product prepared by the process, and thus claim 10 is also anticipated by the prior art.

4. Claims 1-4, 9, and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 3,903,234 to Ikeda *et al.*

The prior Ikeda *et al.* teaches a process for melt-blending a polymer with inert filler having an average particle size of 0.3-8  $\mu$  (300-8000 nm), forming a film from the melt blend, and sequentially stretching the film in mutually perpendicular directions (*i.e.* biaxial stretching), followed by cooling the film (claim 1). According to the current specification, nanoparticles are particles on order of about 400-700 nm (page 5, line 3). Thus, the filler particles of Ikeda *et al.* qualify as a nanoparticles. Incorporation of nanoparticles would impart strain-hardening characteristics to cast films of Ikeda *et al.*, and since the film is stretched biaxially to cause orientation of polymer chains, it follows that the strain hardening phenomenon would also occur. As such, the subject matter of present claim 1 is anticipated by the cited reference.

The remaining claims describe meaningful developments of the present invention. With respect to present claim 2, the patent teaches use of polyolefin homopolymers and copolymers such as polyethylene. Polyethylene is a crystallizing polymer and it is an aliphatic polymer

(claim 1; col. 4, lines 43-60). The shape of filler is not specified, but if it does not possess a defined geometry (*i.e.* spherical, rod-like, conical, oblate, cubical, *etc.*), then it is defined as a particle of irregular geometry. The shape will fall in one of the two categories, and at least one dimension is in the nanoscale because the average particle size is in the nanoscale range. Thus, it is deemed that claim 3 is anticipated by the prior art. The subject matter of claim 4 is also taught in the patent. Filler includes titanium dioxide and clays (col. 5, line 34), and since the average particle size is in the nanoscale range, they conform to the nomenclature, “metal oxide nanoparticles” and “nanoclays,” of the present claim. Regarding claim 9, clearly, the thermoplastic resin must be at least partially molten in order to effect strain hardening by stretching. To corroborate this notion, Ikeda *et al.* states that the film is prepared from a melt blend (see claim 1). The film is the product prepared by the process, and thus claim 10 is also anticipated by the prior art.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,407,155 to Qian *et al.*

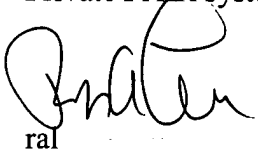
The discussion of the disclosures of the prior art from paragraph 3 of this office action is incorporated here by reference. Qian *et al.* teaches use of 0.05-60 wt % of nanoparticulate filler (claim 41), but the reference does not express or teach this amount in terms of a volume percentage. However, in light of the fact that the range disclosed in the patent spans two orders of magnitude, it would have been obvious to one of ordinary skill in the art that a reasonable basis exists to believe that the 0.05-60 wt % range encompasses the recited ranges of 0.01-10 vol %, 0.1-10 vol %, and 1-10 vol % ranges set forth in the present claims. Since the specification

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does not provide a standard as to how such an amount may be determined, and since the PTO does not perform experiments, the burden is shifted to the Applicants to establish an unobviousness difference. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rip A. Lee whose telephone number is (571)272-1104. The examiner can be reached on Monday through Friday from 9:00 AM - 5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached at (571)272-1114. The fax phone number for the organization where this application or proceeding is assigned is (703)872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <<http://pair-direct.uspto.gov>>. Should you have questions on the access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).



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February 3, 2005